

2009 JPL SURP Strategic Topic Areas

Topic Area:	4. An Integrated Earth System Science Information System for Research and Applications
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This Strategic Challenge (SC) targets an understanding of the effects of climate change on the Earth system including both the human activity on Earth and influence from the Sun. It seeks to set the foundation for designing future Earth observing missions, address the most societally-relevant science challenges, and creating high impact, widely-accessible Earth information. This SC will address the following questions:

- What are the major Earth system dynamical processes, especially those that couple or provide feedback to various components?
- Are there critical elements (e.g., thresholds, bottlenecks, switches) in the Earth system?
- What is the relative role of anthropogenic and solar forcing in modulating Earth climate fluctuations?
- What is the optimal strategy for generating, processing and integrating relevant Earth system data sets?
- How can Earth science information relevant to society be made accessible to decision-makers and the broader public?

Over the last decade, NASA and JPL's Earth science missions have yielded rich observational data sets. The recently released NRC Decadal Study for Earth Science has recommended a number of Earth science missions with heavy JPL participations in the coming decade. Enhanced understanding of Earth climate requires an integrated approach linking these satellite observations with complementary *in situ* measurements and numerical model simulations. Despite the fact that all the Earth science data sets are accessible to the public, they have yet to be exploited to their fullest potential. This SC will extend the traditional Earth science data system (e.g., Data Active Archive Centers) by using state-of-the-art Information Technology (IT) and Computing Technology (CT) with an aim to translate research data products to information that can be readily used by policy and decision-makers.

This SC is intrinsically a multidiscipline effort, where JPL strengths in satellite observations can synergize with the universities' modeling/theoretical capabilities. Working in partnership with a number of academic centers is desirable to maximize the areas of expertise that could come together and result in new scientific knowledge.

The proposed project will be distributed among various partner institutions with JPL providing leadership and coordination. In the long term, this project will provide a point of entry for Earth science data sets and models, although the data may be physically stored at different locations.

Potential Areas for Technical Follow-up:

- Innovative instrument and platform concepts for Earth observing
- Theoretical and numerical modeling including atmosphere, ocean/sea-ice and land-surface
- Earth System Modeling Framework (ESFM)
- Sun-Earth connections including space weather
- Data assimilation with a particular focus on the satellite data
- Data and information management, high-throughput computing, and visualization of large data sets and/or model output (e.g., potential collaborations with Google's GoogleEarth and Microsoft's Virtual Earth)
- Earth science sensor web that links both *in situ* and satellite assets and predictive models and enables adaptive observing and decision making